

Know How Backpressure Regulators



Backpressure regulators control an adjustable constant pressure upstream of the valve. A spring keeps the valve close. As the inlet pressure rises the valve opens.

Selecting valve type and nominal diameter

Using your maximum operating data and the smallest differential pressure Δp , you should calculate the characteristic performance figure K_v (see leaflet Calculation of Pressure Regulators). Select a valve whose K_{vs} value is 30 % greater than the calculated K_v figure. Additional allowances must be made for high-viscosity liquids or liquids which vaporise when depressurised.

Backpressure regulators should not be overdimensioned. Their optimum working range is within 10 % to 70 % of their K_{vs} value.

Selecting rated pressure and valve material

The rated pressure must exceed the maximum system pressure, irrespective of safety allowances. Please note also the effect of the temperature (see DIN 2401).

Selecting the setting range

For good control accuracy you should select a setting range which places the required inlet pressure near its upper limit. If, for example, the controlled inlet pressure is to be 2.3 bar, you should select the 0.8 to 2.5 bar setting range, not 2 to 5 bar. If the available setting range is not wide enough you may go below the bottom limit of the setting range provided that the valve loading is kept low and a high control accuracy not required.

Selecting elastomer materials

You should select elastomers according to the operating temperature and the requirements of the medium. High-pressure gases, for example, can diffuse into the elastomer and cause damage when being depressurised.

Flow velocity

Depending on pressure drop and permitted maximum noise level, we recommend the following flow velocities:

Liquids	1	-	5	m/s
Saturated steam	10	-	40	m/s
Superheated steam	15	-	60	m/s
Gases up to 2 bar	2	-	10	m/s
Gases above 2 bar	5	-	40	m/s

Sense line (control line)

You should install a sense line if the selected backpressure regulator is designed for sense line operation. The sense line should be connected at a distance of not less than 10 times nominal diameter upstream of the valve. No isolating valves should be installed in the sense line to avoid an excessive pressure differential between valve body and diaphragm. To attenuate any oscillations occurring in the pipeline system, the sense line may be fitted with a restrictor which must never be fully closed during operation.

In the case of steam and liquids the sense line must be installed so as to fall towards the valve. Under special operating conditions, for example intermittent operation with dry steam, a compensation vessel must be installed. The sense line must be rigid as elastic hoses can induce oscillations.

Protecting your system

To protect your system you should install a safety valve upstream of the backpressure regulator to prevent the maximum permitted operating pressure (normally 1.5 x maximum set pressure) being exceeded. The safety valve operating pressure should be set approximately 40 % above the maximum set pressure of the backpressure regulator to avoid blow-off during slight pressure fluctuations. For example: if the setting range of the backpressure regulator is 2 - 5 bar the safety valve operating pressure must be 1.4 x 5 bar = 7 bar.

Protecting the backpressure regulator

To protect the backpressure regulator against damage from solid particles carried in the pipeline, a strainer or filter should be fitted and serviced at regular intervals.

Valve seat leakage

These valves are no shut-off elements ensuring a tight closing of the valve. In accordance with DIN EN 60534-4 and/or ANSI FCI 70-2 they may feature a leakage rate in closed position in compliance with the leakage classes II - V:

Leakage class II (metal sealing double seat cone) = 0.5% K_{vs} value

Leakage class III (metal sealing cone) = 0.1 % K_{vs} value

Leakage class IV (PTFE seal cone) = 0.01 % K_{vs} value

Leakage class V (soft seal cone) = $1.8 \times 10^{-5} \times \Delta p \times D^*$ [l/h]

*D=seat diameter

Any low leakage requirement must be expressly specified when ordering. Valve leakage can be considerably reduced by special measures such as lapping the valve seat, using special cone seals and increasing the control (diaphragm) surfaces.

Cut-off

For the purpose of installation, servicing and isolation of the valve, shut-off valves should be installed upstream and downstream of the backpressure regulator. When closing the shut-off valves the upstream valve must always be closed first. A bypass line may be necessary to maintain emergency operation.

Stellited seat and cone

In the case of abrasive media or liquids with pressure drops (inlet pressure minus outlet pressure) of more than 25 bar the valve cone must be stellited; for pressure drops above 150 bar the seat must be stellited as well.

Leakage line

If toxic or hazardous media are used the valve must feature a sealed spring cap (including setting spindle seal) fitted with a leakage line connection. When the backpressure regulator is installed on site a leakage line must be fitted capable of safely and pressureless draining the escaping medium in case the control valve should become defective.

Mounting position

For gases a backpressure regulator can normally be fitted in horizontal pipelines with the spring cap at the bottom or at the top. Installation in vertical pipe runs is possible but can result in increased wear and loss of control accuracy owing to increased friction.

In the case of liquids a backpressure regulator should be installed with the spring cover at the bottom. Thus gas traps upstream of the valve are avoided which would cause the valve to oscillate.

For steam a backpressure regulator should likewise be installed with its spring cover at the bottom to protect the diaphragm against overheating by means of a layer of condensate. In case the valve must be emptied completely during operation (angle valves), it must be installed with the spring cap pointing upwards.

Start-up

backpressure regulators should be started up and operated without pressure surges, if possible. A sudden operation of upstream or downstream valves should be avoided.

Steam operation

If a backpressure regulator is installed in a steam plant the diaphragm water reservoir must be filled before the plant is started up. There must be no danger of overheating at the installation site caused by excessive ambient temperatures or insufficient heat dissipation. backpressure regulators must not be insulated. In some cases an insulating of the body is permitted, but only with cast bodies. Never insulate diaphragm housing, mid section and spring cap (or open springs). Overheating caused by insulating destroys the elastomere of the control unit.

Setting the pressure

Backpressure regulators are normally supplied by us with a relaxed spring. This means that a valve is set at the factory to the minimum inlet pressure. The required pressure should be set under operating conditions.

Maintenance

Backpressure regulators must be cleaned and serviced regularly.

Valves free of oil and grease or silicone

Please pay attention to order a fit only spares free of oil and grease resp. free of silicone.

Please consult our engineer if extreme operating conditions apply or whenever you are in doubt.

Notes on Safety, operating instruction etc. MUST be followed.